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(54) DEVICE FOR DEVELOPMENT OF MOBILITY OF LOWER LIMB JOINTS

The present invention refers to medicine, specifically to orthopedics and traumatology.

A known device exists for development of mobility of the leg joints, containing a frame, a drive with a reversing electrical engine and gear-box, crank gear with an adjustable crank length and limb manipulator [1].

However, this known device does not ensure simultaneous development of several joints in two planes and does not allow for the adjustment of limb swing angle.

The purpose of the present invention is to ensure simultaneous development of several joints in two planes and adjustment of limb swing angle.

This purpose is achieved by utilizing a limb manipulator consisting of a carrier with guides mounted on the frame, and a mobile carriage on the guides connected with the crank gear, a gear sector and a rail with a pin, a changeable template with grooves in the carriage and two extensible drawing bars with support pedal,

connected via a hinge joint with each other and with the gear sector and the carrier. The pin of the rail is placed in the groove of the template, and the template is fixed on the support. Furthermore, the limb manipulator has a crank arm and a drawing bar connected with the rail.

Figure 1 shows the device for development of mobility of lower limb joints in a cross-section; figure 2 shows the crank arm with the drawing bar.

The device for development of mobility of lower limb joints contains frame 1, which carries a drive with reversing electrical engine 2 and gear-box 3, crank gear with length adjusted crank 4, which is connected with the rod 5 via a hinge-joint. Rod 5 is utilized to move carriage 7 along guides 6, which construe the limb manipulator along with gear sector moving in transverse direction relative to rail 9 with pin 10, changeable template 11 with grooves, carrier 12, connected via hinge-joint with support pedal 13 and drawing bars 14,

15 and 16, the latter being fixed with screw 17.

Angle meters 19 - 22 are utilized to measure joint movement angles. Crank arm 23, drawing bar 24 and plank 25 with apertures to adjust the angle are utilized for transverse swinging of the patient's limb. The patient's limb is attached to drawing bars 14 and 15 via straps 26. There are three modes of development of lower limb mobility.

Mode 1 (flexion and extension of the limb).

Longitudinal movement of the carriage and longitudinal swinging of connected drawing bars to which the patient's limbs are attached, without transverse swinging. This mode is implemented by installation of a changeable template 11 with groove, the axis of which is parallel to the direction of carriage 7. Then the length of drawing bars 14 and 15 is adjusted for the patient's limb, crank 4 is selected to match the necessary angles of movement, and the necessary inclination of pedal-support 13 is set using part 18. By extending the drawing bar 16 from frame 1 the necessary range of angle movement is set, and the electrical engine is powered on.

Mode 2 (abduction and adduction of the limb).

Transverse swinging of drawing bars carrying the patient's limb. This mode is implemented by removal of crank 5 and changeable template 11 and installation of crank arm 23, which is connected with crank 4 and with drawing bar 24 via a hinge joint, the latter being connected with rail 9 via another hinge joint. Rotation of crank 4 causes crank arm 23 to swing around centre 27 and to move rail 9 in transverse direction. Rail 9 moves drawing bars 14 and 15. Prior to powering electrical engine the length of drawing bars 14 and 15 should be adjusted for the patient's limb, and direction and

location of limb swinging should be chosen by changing centre 27 of crank arm 23 on plank 25.

Mode 3 (simultaneous flexion/extension and adduction/abduction of the limb).

This mode is implemented by installation of changeable template 11 with groove; the axis of this template is inclined at the necessary angle relative to carriage direction. The length of drawing bars 14, 15, and crank 4 is selected accordingly; by extending drawing bar 16 from frame 1 the range of angle motion is set; then the electrical engine is powered on.

Thus, the present device for development of lower limb joint mobility has a wide range of adjustment of swinging pace at all possible directions and enables simultaneous flexion/extension and abduction/adduction of the limb.

Summary of Invention

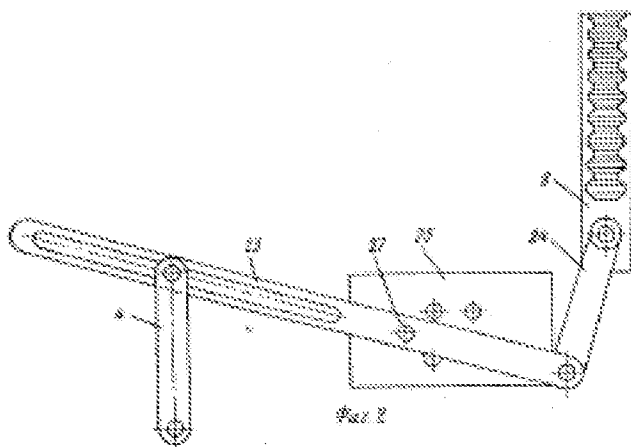
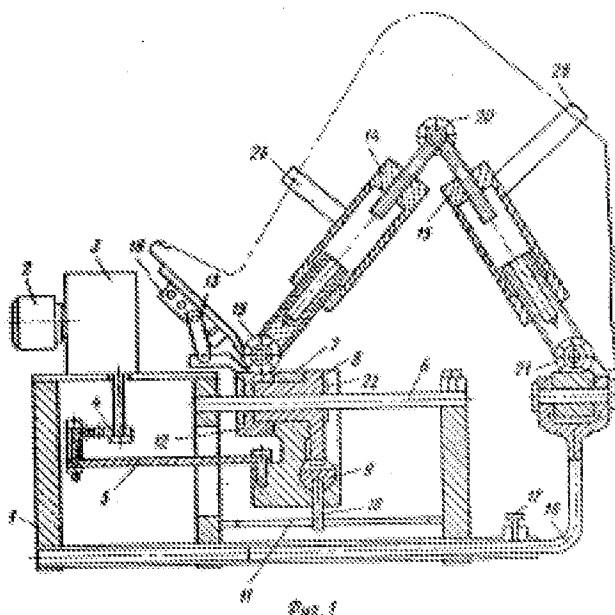
1. Device for development of mobility of lower limb joints containing a frame, a drive with reversing electrical engine and gear-box, crank gear with adjusted crank length and limb manipulator, distinguished by simultaneous development of several joints in two planes; the limb manipulator contains, carries and guides on the frame, a carriage connected with the crank gear and moving on the guides, gear sector and rail with a pin, a changeable template with grooves in the carriage and two extensible drawing bars with support pedal, connected via hinge joint with each other and with the gear sector and the carries; the pin of the rail is placed in the groove of the template, the template is fixed on the support.

2. Device as per clause 1, where the limb manipulator has crank arm and a drawing bar connected with the rail in order to adjust the angle of swinging the limb.

Sources of information considered for expert evaluation:

1. USSR Certificate of Authorship No.371935, cl. A 61 F 5/04, 1973.

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